

Occupational ergonomics in the library workplace

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ABSTRACT

Ergonomics is defined as the study of the interaction between people and machines and the factors that affect the interaction Occupational Safety and Health Administration. This study assessed the occupational ergonomics of the selected academic libraries in Cebu City, Philippines. As revealed, majority of the libraries under study are practically ergonomically designed, however they had poor percentage of the following: not one of the librarians had document holder and wrist/palm rest, majority do not use armrest when performing computer task and almost all librarians did not have a stable feet rest on the floor. The top five (5) ergonomic symptoms felt by the respondents were pain in neck, headache, pain in wrist and numbness in the hands. There is no significant correlation between the librarians' height and weight and their level of awareness of ergonomics on health status. There is no significant relationship between the librarians' level of awareness of ergonomics on health status and ergonomics. Furthermore, level of awareness of ergonomics on health status is not a determinant factor on the librarians' experience on ergonomic symptoms.

Keywords: academic libraries, ergonomics, ergonomic symptoms, occupational ergonomics

I. INTRODUCTION

Ergonomics is defined as the study of the interaction between people and machines and the factors that affect the interaction Occupational Safety and Health Administration (OSHA, 2003). Its purpose is to improve performance of the system by improving human-machine interaction. The age of machine and technology in this fast phase world, brought both positive and negative changes and impacts on the lives of people. On one hand it makes the work faster and easier, while on the other hand it also affects the health of workers especially if ergonomics is not applied in their workplaces. One of the impacts of computer technology is on academic libraries.

Libraries are important part of the educational system. Similarly librarians are very essential in providing quality information services to library patrons. Thus poor working conditions may affect their physical well-being. Libraries are known to be quiet work places, hardly the scene of occupational accidents. However, occupational hazards exist, often contrary to common perceptions, in conspicuously quiet places like libraries, archives and

museums. The nature of librarians work is injurious to the body sitting all day in front of the computer, lifting and shelving books, etc. can cause muscle tension due to the unergonomic design of workplace.

The Occupational Safety and Health Center (OSHC, 2009) reported that the exposure to ergonomic hazards made up the bulk of reported occupational complaints. The increasing number of workers affected by poor work design make ergonomic issues important. According to Atkins (2005) achieving an ergonomic work environment entails checking and changing the layout of the work area, deploying ergonomic equipment and tools, and implementing education and training programs to promote safe work practices to make sure healthful conditions.

Adeyemi (2010) report that failure to offer, or educate about proper ergonomic equipment, space, work schedule/ behaviour can result to injury. Injuries can result in loss of work and permanent disability. Injuries caused by working too long at a task without a break or not working the proper way to sit at a workstation. Ergonomics shall be a basis for designing

and redesigning jobs and workplaces to prevent or put a stop to health problems such as headaches, backache, neck aches, sore wrists, arms and legs, and eyestrain; or worse, Cumulative Trauma Disorders (CTDs) or Repetitive Strain Injuries (RSIs) Bridger (2009).

The International Labour Organization (ILO, 2008) rightly notes that for many workers in developing countries, ergonomic problems may not have a high priority among the health and safety problems they face. In the Philippines, ergonomics is a new thing, there are only a few researches, such as a study in Luzon which was about the workstations of other fields and automated workstation of library staffs.

Previous researches have focused on much suggestions and ways to adjust the workplace to make it conducive for work to prevent or reduce physical strain brought about by ergonomic factors. The purpose of this study aimed to assess the occupational ergonomics of the selected academic libraries in Cebu City, Philippines, specifically to evaluate the status of the library workplace in terms of ergonomic design, to outline the profile of the librarians, to examine the ergonomic symptoms experienced by the librarians and to look into librarians' level of awareness of ergonomics on health status. Finally, to establish the relationship between the following: (a) the relationship between librarians profile and ergonomic symptoms and level of awareness of ergonomics on health status; and (b) the relationship between the librarians' level of awareness of ergonomics on health status and ergonomics symptoms.

II. THEORETICAL FRAMEWORK

For This study is anchored on the Theory of Petersens's Accident/Incident Theory and the Presidential Decree No. 442 known as "The Labor Code of the Philippines", Article No. 162 - Occupational Health and Safety, EO 3017, s. 2006 [Department of Labor (1974)]. The accident/incident theory is an extension of the human factors theory. It was developed by Dan Petersen and is sometimes referred to as the Petersen accident/incident theory.

Petersen introduced such new elements as ergonomic traps, the decision to err and systems failures. First, he conceptualized the environmental aspect of incompatibility (workstation design and display/controls) as a different part of the model, calling them as ergonomic traps. Second, he also separated a decision to make mistake, these reasons include a logical decision due to a situation (primarily for financial cost and temporal deadlines), an unconscious or conscious desire to err (psychological failings) and perceived low probability of an accident occurring. And third, is a system failure, the inability of the organization to correct

errors, was added between errors and accidents, the failure of management to detect mistakes and lack of training and even absence or poor policy are examples of systems failure, Reese (2001). This theory is important in this study, as it can reveal both the occupational ergonomics of library workplace and where improvements are necessary.

Legal Basis: Presidential Decree No. 442 (Labor Code of the Philippines), Article No. 162- Safety and Health Hazards. A Decree instituting a labor code, thereby revising and consolidating labor and social laws to afford protection to labor, promote employment and human resources development and ensure industrial peace based on social justice. The Department of Labor and Employment (DOLE) is the lead agency of the government in charge in the administration and enforcement of laws, policies, and programs on occupational safety and health.

The Secretary of Labor and Employment shall, by appropriate orders, set and enforce mandatory occupational safety and health standards to eliminate or reduce occupational safety and health hazards in all workplaces and institute new, and update existing, programs to ensure safe and healthful working conditions in all places of employment, this decree particularly article No. 162, is essential to the study as it mandates that all workplaces which include libraries must be safe and free from hazards.

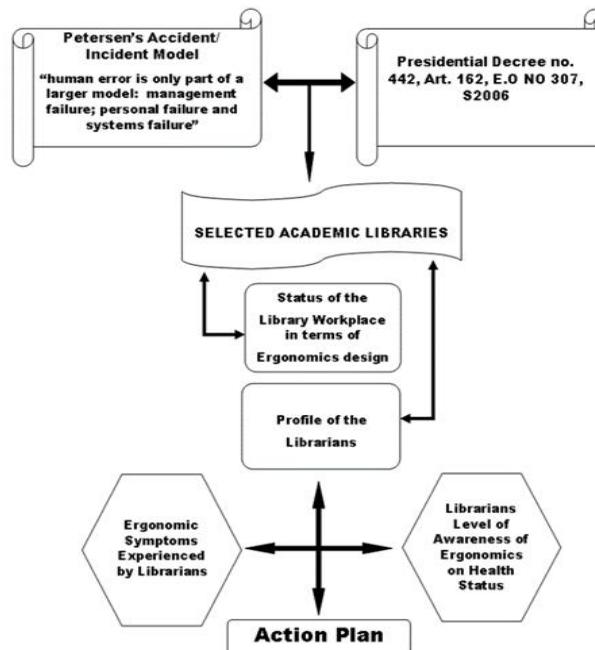


Figure 1. Schematic Diagram of the Theoretical Framework

Figure 1 illustrates the ergonomic symptoms and the level of awareness of ergonomics on health status experienced by the librarians and the status of the



library workplace in terms of ergonomic design of the selected academic libraries where the respondents are working. It established the relationship between the profile of the librarians, ergonomic symptoms and the respondents' level of awareness of ergonomics on health status. Based on the findings of the study, an action plan is proposed to address the occupational ergonomic problems.

III. METHODOLOGY

This study adopted the descriptive survey method of research using the checklist and survey questionnaires. It was conducted in the selected academic libraries in Cebu City, Philippines. Out of the 91 librarians a total of 75 librarians with complete data constituted the respondent. Among the literatures reviewed the Occupational Safety and Health Administration website was chosen for the relevant content in relation to ergonomics. The first instrument used was the Ergonomics Solutions: Evaluation Checklist by Occupational Safety and Health Administration to evaluate the status in terms of ergonomic design of libraries under study which was administered by the researcher and second was the survey questionnaire which was patterned and modified from the research study of Adeyemi (2010) entitled Case Study of Ergonomic Awareness among Library Staff of Two Universities in South-Western Nigeria. The researcher sent an email to Adeyemi requesting permission to use the questionnaire of her study for it is related to the present study. A period of one week was given to each library for the retrieval of the instruments. Frequency was used to describe the magnitude on the status of the library workplace in terms of ergonomics design and on the profile of librarians. Mean was used to determine the level of awareness of ergonomics on health status. Chi-square was used to establish the relationship between librarians' profile and ergonomic symptoms. To find the significant relationship between the librarians' profile level of awareness of ergonomics on health status. The Pearson Product Moment Coefficient of correlation (r) was used. Finally, f-test was used to find the difference in the level of awareness of ergonomics in terms of area of work.

IV. RESULTS AND DISCUSSION

Table 1 shows the profile of the respondents relative to: age, library experience, area of work, height and weight. Most librarians were from the age group of 41-50 with twenty-five (25) or 33.33%. The most number of

library experience was 16 years and above with thirty-three (33) or 44.00%. The study also shows that out of 75 librarians who answered the questionnaires (47) were assigned in reference/information services which is 62.67%. A greater number of librarians were 5 feet to 5 feet and 2 (5'-5'2") inches tall with forty-nine (49) or 65.33%. Further shows that most librarians weighed 50 – 59 kgs. with thirty (30) or 39.47%.

Table 1
Profile of the Respondents

| Age | f | % |
|---------------------------|-----------|---------------|
| 21-30 years old | 14 | 18.67 |
| 31-40 years old | 24 | 32.00 |
| 41-50 years old | 25 | 33.33 |
| 51-60 years old | 9 | 12.00 |
| 61 & above | 3 | 4.00 |
| Total | 75 | 100.00 |
| <hr/> | | |
| Library Experience | | |
| 1-5 years | 11 | 14.67 |
| 6-10 years | 21 | 28.00 |
| 11-15 years | 10 | 12.00 |
| 16 & above years | 33 | 44.00 |
| Total | 75 | 100.00 |
| <hr/> | | |
| Area of Work | | |
| Technical Services | 21 | 28.00 |
| Reference/Information | 47 | 62.67 |
| Services | 7 | 9.33 |
| Library Administration | 7 | 9.33 |
| Total | 82 | 100.00 |
| <hr/> | | |
| Height | | |
| 4'9"- 4'11" | 15 | 20.00 |
| 5'- 5'2" | 49 | 65.33 |
| 5'3"- 5'5" | 10 | 13.34 |
| 5'6"- 5'8" | 1 | 1.33 |
| Total | 75 | 100.00 |
| <hr/> | | |
| Weight | | |
| 40- 49 kgs. | 20 | 26.32 |
| 50- 59 kgs. | 29 | 39.47 |
| 60- 69 kgs. | 16 | 21.05 |
| 70- 79 kgs. | 2 | 9.21 |
| 80- 89 kgs. | 1 | 1.32 |
| 90- 99 kgs. | 2 | 2.63 |
| Total | 75 | 100.00 |

Tables 2.a & 2.b presents the status of the library workplace in terms of ergonomics design. There were two aspects evaluated: computer (working posture, seating, keyboard/input device, monitor and accessories) and work area. As a whole, the result of the evaluation which was administered by the

researcher utilizing the checklist from OSHA, majority of the libraries under study are practically ergonomically designed. However, libraries had a poor percentage of the following: not one of the librarians had a document holder and wrist/palm rest, majority do not use armrest

when performing computer task and almost all librarians did not have a stable feet rest on the floor.

Table 2.a
Status of the Workplace in Terms of Ergonomic Design

| I. Computer | YES | | NO | |
|---|-----|-------|----|-------|
| | f | % | f | % |
| Working Posture | | | | |
| Head and neck to be upright, or in-line with the torso (not bend down/back). | 73 | 97.33 | 2 | 2.67 |
| Head, neck, and trunk to face forward (not twisted). If "no" refer to Monitor or Chairs. | 69 | 92.00 | 6 | 8.00 |
| Trunk to be perpendicular to floor (may lean back into backrest but not forward). If "no" refer to Chairs or Monitor. | 15 | 20.00 | 60 | 80.00 |
| Shoulders and upper arms to be in-line with the torso, generally about perpendicular to the floor and relaxed (not elevated or stretched forward) If "no" refer to Chairs. | 11 | 20.00 | 60 | 80.00 |
| Upper arms and elbows to be close to the body (not extended outward). If "no" refer to Chairs, Work Surfaces, Keyboards and Pointers. | 11 | 14.67 | 64 | 85.33 |
| Forearms, wrists, and hands to be straight and in-line (forearm at about 90 degrees to the upper arm). If "no" refer to Chairs, Keyboards, Pointers. | 11 | 14.67 | 64 | 85.33 |
| Wrists and hands to be straight (not bent up/down or sideways toward the little finger). If "no" refer to Keyboard, or Pointers. | 69 | 14.67 | 64 | 85.33 |
| Thighs to be parallel to the floor and the lower legs to be perpendicular to floor (thighs may be slightly elevated above knees). If "no" refer to Chairs or Work Surfaces. | 2 | 92.00 | 6 | 8.00 |
| Feet rest flat on the floor or are supported by a stable footrest. | 2 | 2.2 | 73 | 97.33 |
| Seating | | | | |
| Backrest provides support for your lower back (lumbar area). | 41 | 54.95 | 4 | 45.05 |
| Seat width and depth accommodate the specific user (seat pan not too big/small). | 6 | 87.91 | 9 | 12.09 |
| Seat front does not press against the back of your knees and lower legs (seat pan not too long). | 66 | 87.91 | 9 | 12.09 |
| Seat has cushioning and is rounded with a "waterfall" front (no sharp edge). | 66 | 87.91 | 9 | 12.09 |
| Armrests, if used, support both forearms while you perform computer tasks and they do not interfere with movement. | 2 | 2.67 | 73 | 97.30 |
| Monitor | | | | |
| Top of the screen is at or below eye level so you can read it without bending your head or neck down/back. | 3 | 97.80 | 2 | 2.67 |
| User with bifocals/trifocals can read the screen without bending the head or neck backwards. | 75 | 100 | 0 | 0 |
| Monitor distance allows you to read the screen without leaning your head, neck or trunk forward/backward. | 75 | 100 | 0 | 0 |
| Monitor position is directly in front of you so you don't have to twist your head or neck. | 69 | 92.00 | 6 | 8.00 |
| Glare (for example, from windows, lights) is not reflected on your screen which can cause you to assume an awkward posture to clearly see information on your screen. | 68 | 90.67 | 7 | 9.33 |

60% and above = Good

Below 60% = Poor

Table 2.b

Status of the Workplace in Terms of Ergonomic Design

| I. Computer Area | YES | | NO | |
|--|-----|-----|----|---|
| | f | % | f | % |
| Keyboard/Input Device | | | | |
| Keyboard/Input device platform(s) is stable and large enough to hold a | 5 | 100 | 0 | 0 |

keyboard and an input device.

| | | | | |
|---|----|-------|----|-------|
| Input device (mouse or trackball) is located right next to your keyboard so it can be operated without reaching. | 3 | 7.80 | 2 | 2.67 |
| Input device is easy to activate and the shape/size fits your hand (not too big/small). | 5 | 00 | 0 | 0 |
| Wrists and hands do not rest on sharp or hard edges. | 0 | 0 | 5 | 100 |
| Accessories | | | | |
| Document holder, if provided, is stable and large enough to hold documents. | 0 | 0 | 5 | 100 |
| Document holder, if provided, is placed at about the same height and distance as the monitor screen so there is little head movement, or need to re-focus, when you look from the document to the screen. | 0 | 0 | 75 | 100 |
| Wrist/Palm rest, if provided, is padded and free of sharp or square edges that push on your wrists. | 0 | 0 | 75 | 100 |
| Wrist/Palm rest, if provided, allows you to keep your forearms, wrists, and hands straight and in-line when using the keyboard/input device. | 0 | 0 | 75 | 100 |
| Telephone can be used with your head upright (not bent) and your shoulders relaxed (not elevated) if you do computer tasks at the same time. | 52 | 9.33 | 3 | 30.67 |
| II. Work Area | | | | |
| Thighs have sufficient clearance space between the top of the thighs and your computer table/keyboard platform (thighs are not trapped). | 75 | 100 | 0 | 0 |
| Legs and feet have sufficient clearance space under the work surface so you are able to get close enough to the keyboard/input device. | 5 | 100 | 0 | 0 |
| Work station and equipment have sufficient adjustability so you are in a safe working posture and can make occasional changes in posture while performing computer tasks. | 1 | 4.67 | 4 | 45.33 |
| Computer workstation, components and accessories are maintained in serviceable condition and function properly. | 7 | 76.00 | 18 | 24.00 |
| Tasks are organized in a way that allows you to vary tasks with other work activities, or to take micro-breaks or recovery pauses while at the computer work-station. | 5 | 100 | 0 | 0 |

60% and above = Good

Below 60% = Poor

Table 3 reveals the top five (5) ergonomic symptoms experienced by the respondents. This indicates that librarians' health is affected by ergonomic factors. It shows that prevalent pain in neck, headache, pain in wrist and numbness in the hands. Probably, the librarians had improper working postures while working at the computer. Another reason was working for too long in the computer without moving caused such problems.

The result supported the study of Tepper (2008) which utilizes the Musculoskeletal Discomfort Survey as the pre-intervention method use to survey the discomfort felt by the respondents it is was found that the posture of library employees' wrist and neck which are putting subjects at the greatest risk for injury. The



findings supported Baking's (2008) study which indicated that academic librarians experienced less stress on the eyes but they experienced much pain on the wrist and neck when working at their computer. In the study of Adeyemi (2009), the most visible ergonomics symptoms are pain in wrist, forearm, elbow, neck or back , tension, stress, headaches and related ailments. Another study conducted to librarians aged 23-35 years indicated that the librarians' health is affected by ergonomic factors and the staff had some kinds of musculoskeletal symptoms and disorders. The greatest complications were on neck and back discomfort caused by working with improper working tools. Despite the population being young, the incidence of complications was high and there was a meaningful relationship between increasing musculoskeletal symptoms. Moreover, the working factors affected different parts of the body were found mostly in the neck and back regions (Gavagni, Nazari, Jafarabadi, & Rastegani, 2013).

Table 3
Top Five (5) Ergonomics Symptoms Experienced by the Librarians

| Ergonomic Symptoms | f | % |
|----------------------|----|-------|
| Pain in Neck | 63 | 84.00 |
| Headache | 54 | 72.00 |
| Stress | 50 | 66.67 |
| Pain in Wrists | 38 | 50.67 |
| Numbness in the Hand | 36 | 48.00 |

Table 4
Librarians' Level of Awareness of Ergonomics on Health Status by Age Group

| Age Group | n | \bar{x} | SD | Qualitative Description |
|-----------------|----|-----------|------|-------------------------|
| 21-30 years old | 16 | 3.36 | 0.29 | Much Aware |
| 31-40 years old | 22 | 3.61 | 0.47 | Much Aware |
| 41-50 years old | 24 | 3.54 | 0.38 | Much Aware |
| 51-60 years old | 10 | 3.48 | 0.36 | Much Aware |
| 61 & above | 3 | 3.54 | 0.48 | Much Aware |
| Σ | 75 | 3.57 | 0.40 | Much Aware |

Table 4 presents the librarians' level of awareness of ergonomics on health status by age group. It can be summarize that the librarians' is much aware. This implies that librarians are much aware that their health is affected by ergonomic factors, presumably they know already about the application of ergonomics in the workplace and its importance to make better working conditions. Whether young or old, short or longer library experience, short or tall, light or heavy they may or may not have high or low level of awareness of ergonomics on health status. It contradicted (Baking, 2008) study that ergonomic awareness and practices among catalogers were nil. On the other hand, the same findings with that of (Adeyemi, 2010) which demonstrated that the respondents are aware of ergonomics and have experience ergonomic symptoms at one time or another.

Table 5
Chi-square Analysis on the Correlation between Librarians' Profile and Ergonomic Symptoms

| Variables | df (r-1) c-1) | Test Statistics | |
|---|------------------|-------------------------|---|
| | | Computed X ² | Tabled Value at $\alpha = .05$ w/ (r-1) c-1) df |
| Age and Ergonomic Symptoms | 12 | 2.579 ^{ns} | 21.026 |
| Library experience and Ergonomic Symptoms | 12 | 2.071 ^{ns} | 21.026 |
| Area of Work and Ergonomic Symptoms | 8 | 2.632 ^{ns} | 15.507 |
| Height and Ergonomic Symptoms | 8 | 2.548 ^{ns} | 15.507 |
| Weight and Ergonomic Symptoms | 12 | 2.464 ^{ns} | 21.026 |

^{ns} = not significant

Table 5 shows the correlation between the librarians' profile and ergonomic symptoms. The table below shows that in all variables like age, library experience, area of work, height and weight are not correlated with ergonomic symptoms, meaning regardless of age, library experience, area of work, height and weight of the librarians ergonomic symptoms may be low or high. This implies that it does not affect whether young or old, longer library experience or less library experience, whether you are assigned in technical services, reference/information services or library administration anyone can be affected by ergonomics symptoms such as pain in neck, headache, stress, pain in the study of Mahalakshmi and Sornam (2011) which wrist and numbness in the hand. The same findings in found out that the personal factors of the respondents have no significant influence on ergonomic factors.

Table 6
Correlation Between Librarians' Profile and Level of Awareness Ergonomics on Health Status

| Variables | df | Test Statistics | |
|--|--------|--------------------|--|
| | | Comp. r | Tabled Value at $\alpha = .05$ w/ N -2df |
| Age and Level of Awareness of Ergonomics on Health Status | -0.05 | 0.43 ^{ns} | 1.99 |
| Library experience and Level of Awareness of Ergonomics on Health Status | -0.017 | 1.47 ^{ns} | 1.99 |
| Height and Level of Awareness of Ergonomics on Health Status | 0.14 | 0.14 ^{ns} | 1.99 |
| Weight and Level of Awareness of Ergonomics on Health Status | 0.11 | 0.96 ^{ns} | 1.99 |

^{ns} = not significant

Table 6 reveals the correlation between librarians' profile and level of awareness of ergonomics on health status. The computed t-test of 0.43 and 1.47 were less than the tabled value of 1.99. This was not significant, hence H₀₁, was accepted. This means that there is no significant correlation between the librarians and their level of awareness of ergonomics on health status and that of the librarian's library experience and

their level of awareness of ergonomics on health status. In terms of height and weight in relation to their level of awareness of ergonomics on health status, a low positive correlation was obtained. However, the computed t-test were less than the tabled value, so not significant. This failed to reject H₀ which means that there is no significant correlation between the librarians' height and weight and their level of awareness of ergonomics on health status. This implies that all variables like librarians' age, library experience, height and weight do not have bearings on the level of awareness of ergonomics on health status.

Table 7
Chi-Square Analysis on the Correlation Between Librarians' Level of Awareness of Ergonomics on Health Status and Ergonomic Symptoms

| Variables | df | Test Statistics | |
|---|----|-------------------------|--------------------------------|
| | | Computed X ² | Tabled Value at $\alpha = .05$ |
| Level of Awareness and Ergonomic Symptoms | 4 | 4.021 ^{ns} | 9.488 |

^{ns} = not significant

Table 7 shows the correlation between librarians' level of awareness of ergonomics on health status and ergonomic symptoms. It shows that there is no significant relationship between the librarians' level of awareness of ergonomics on health status and ergonomics. This means that the ergonomic symptoms experience by the librarians is not related with their level of awareness of ergonomics on health status. Furthermore, this means that librarians who are aware or less aware of the effect of ergonomics on health status may or may not have been greatly affected by ergonomic symptoms.

V. CONCLUSION

Based on the findings academic libraries under study are practically ergonomically designed. It validated the theory of Petersen the Accident/Incident which attributed to the ergonomic traps to the managements' failure to provide ergonomically design furniture enough working space and absent of safety policies or trainings to employees- most libraries under study had no document holder and wrist/palm rest, majority do not use armrest when performing computer task and almost

all librarians did not have a stable feet rest on the floor and the individuals' decision to make mistake in terms of working postures and proper use of tools- as revealed that librarians does not observe proper working postures.

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She is a Registered Librarian currently working in the University of the Visayas, Cebu City, Philippines assigned in the graduate studies library. Prior joining the University of the Visayas, she was a Library Specialist in a Non-Government Organization specializing Watershed and Solid Waste Management. Aside from being a librarian she is also active in the academe being a thesis adviser and panelist at Cebu Normal University. Her professional affiliation were the Philippine Librarians Association, Inc. (PLAI) and Cebu Librarians Association, Inc. (CLAI).

Mrs. Labajo develop a desire of serving people in her community, mostly scavengers from Inayawan dumpsite, to help them augment their income she organized a cooperative and successfully registered a consumer cooperative through Cooperative Development Authority (CDA) under the name of "San Pio Homeowners Consumer Cooperative" at Dumlog, Talisay City, Cebu Philippines which she serve as the first Chairperson and presently serving as one the Board of Directors. She believes that "Leaders aren't born, they are made. And they are made just like anything else, through hard work. And that's the price we'll have to pay to achieve that goal, or any goal." – Vince Lombardi.

